The Week In Engineering and Construction

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Requisitioning seen likely for idle truck equipment

Rationing plan instituted for distribution of trucks in view of possible construction equipment shortage; WPB may seize non-essential construction equipment

Announcement this week of a rationing plan for distribution of the limited available supply of trucks, plus a strong probability that non-military truck manufacture will come to a halt this month, emphasize the likelihood of serious shortages of construction equipment later this year. Pointing in the same direction is last month's War Production Board order forbidding sales of tractors except on A-1 priority ratings.

Indications now are that new supplies of both trucks and tractors will be inadequate to meet essential needs. Plans currently under discussion for conversion of manufacturing facilities now used for powered construction equipment to the manufacture of armament raise the possibilty of similar shortages in other types of equipment.

If such a shortage develops, it is probable that WPB will use requisitioning, if necessary, to transfer to war contractors equipment now either idle or devoted to non-essential uses. Actually, it is unlikely that much formal requisitioning would have to be done. Ever-tighter priority restrictions and the early probability of an order flatly forbidding non-essential construction will doubtless throw a great deal of used equipment onto the market.

Truck rationing

The truck rationing system which goes into effect Mar. 9 is entirely independent of priority ratings; a rating is no help at all in buying a truck. Any contractor wanting to buy a truck must make a special application on forms available at all truck sales agencies. The application must be filed with a local allocation officer of the Office of Defense Transportation. These officers are located at the field offices of the I.C.C., Bureau of Motor Carriers.

After approval by the local officer, the application must pass through the Washington offices of ODT and the War Production Board; the latter will issue a certificate of transfer entitling the holder to buy a truck from any dealer.

For the guidance of ODT, the rationing order, M-100, groups truck uses into five classes according to war importance. Trucks of most construction firms doing war work will fall into class 2. Class 1 consists of trucks used in connection with military action in the field and to maintain essential sanitary and public safety services. Class 3 consists of uses having an indirect connection with the war effort, while classes 4 and 5, which are almost certain not to get trucks, cover non-war and luxury uses.

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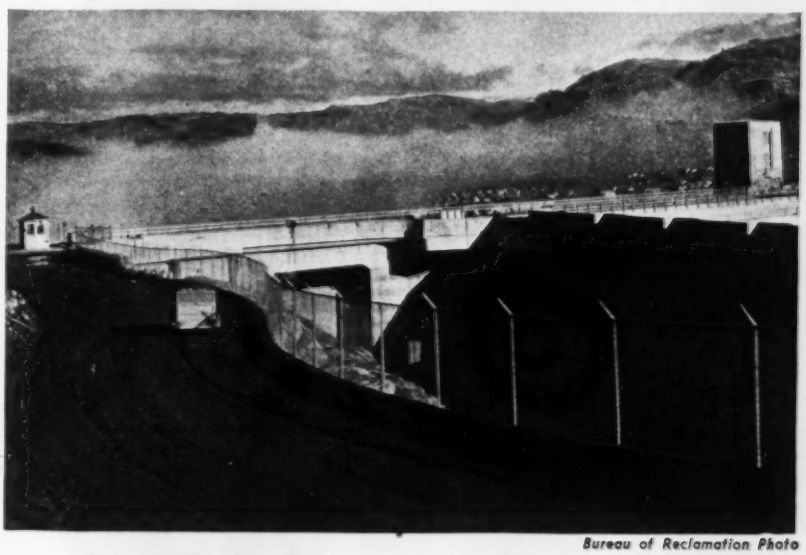
New defense housing critical list issued

A new defense housing critical list, superseding and nullifying the original list issued in Sept., 1941, has been issued by the housing priorities branch, division of industry operation, War Production Board. The list is based upon the present critical position of many materials essential to the construction and equipment of housing, and is subject to revision as changes in the situation develop.

Preference ratings assigned to deliveries of scarce materials for defense housing projects may be applied only to items appearing on the new critical list, which was drawn up to conform to the



Bureau of Reclamation Photo

Grand Coulee Dam area not closed to visitors

The main highway to Mason City and the government settlement officially named "Grand Coulee" still passes very close to one end of the dam, and the vista houses, as well as other vantage points around the job are still accessible to visitors, contrary to rumors recently circulated. The dam itself is heavily guarded, a high wire fence parallels the main highway and special care is devoted to safeguarding the powerhouse and pumping plant areas. This picture, looking downstream from the main highway on the left bank, shows the main dam crest, with one of the elevator towers, and the concrete dam (right, foreground) in which are located the intakes to the pumping plant. Note the octagonal-shaped guard house (left) at the fenced-off roadway over the crest of the dam.

limitations placed upon a number of scarce materials since the issuance of the original list last September.

Some of the major changes affected by the issuance of the new list are:

Structural—Steel bearing plates are eliminated and steel stair construction **is further restricted. Tin coating** for sheet metal coverings on fire doors is eliminated. The use of metal lath is further curtailed. Detailed specifications are included for builders' hardware so as to reduce the use of the more critical metals to a minimum.

Electrical—Armored cable, metallic cable, metallic raceways, and metal outlet boxes are allowed only where other methods are prohibited by the National Electric Code.

Plumbing and Gas Distribution—Quantity and sizes of roughing-in materials are limited to meet the minimum requirements of the Emergency Plumbing Standards, issued by the Defense Housing Coordinator on Dec. 26, 1941. Copper coils for hot water generators and heat exchangers are not allowed. Water softeners are allowed for single units.

Heating—Steam or hot water systems are allowed only for installations serving two or more families; metal jackets for boilers are not allowed. In view of a contemplated limitation of the use of natural or mixed gas, the requirement is made for the submission of proof of the availability of service for installations of this type.

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Somervell to head all army supply

Full implications of the drastic reorganization of the Army are not clear as we go to press, but one immediate effect is to put an engineer officer with a long record of construction and civilian administration into one of the half dozen most important posts in the Army. Maj. Gen. Brehon B. Somervell is to head a new service of supply responsible for all procurement, construction and nonfighting "housekeeping" duties of the Army. This is one of the three services, responsible directly to Chief of Staff Marshall, into which the Army is now divided—superseding the former division into cavalry, infantry, artillery, etc.

Gen. Somervell has long been regarded as one of the most promising officers in the Corps of Engineers. He got his toughest job a year ago when he was put in charge of the construction division of the Quartermaster Corps to rescue the bogged-down cantonment-building program. He held this job until last fall when all construction was assigned to the Engineer Corps. Somervell then became assistant chief of staff in charge of supply.

Revamped Federal Works Agency will tackle war public works needs

Construction of local projects necessitated by war effort to be federal responsibility. W. B. Carey of St. Paul, named chief engineer.

Stripped of its housing job, the Federal Works Agency is revamping itself into a simple engineering and construction outfit with as little concern as possible with social or management problems. First step being taken is to get the lagging defense public works program rolling. To accomplish this the Defense Public Works Administration is being wiped out. The latter organization was set up around the framework of the old PWA to handle the program of providing needed facilities in war-expanded communities.

The public works program now is to be attached directly to the Federal Works Administrator and becomes in effect the construction division of FWA. It will be the special responsibility of a new chief engineer of FWA. To fill this job, Col. William B. Carey has been borrowed from the Jacksonville office of the Corps of Engineers. Carey, a reserve officer, was called to active duty last year from a consulting practice in St. Paul. Earlier he had been state PWA director for Minnesota and city engineer of St. Paul.

Federal-local relationship

Key to the new approach to the public works program is abandonment of the PWA attitude, namely, the conception of the job as a joint federal-local affair. Assistant Administrator Baird Snyder, who is running FWA during the illness of Gen. Fleming, sees the provision of utilities, schools, hospitals and the like to meet war needs as a straight federal responsibility. In the future, when a need for such work is established in an area, FWA will go in and build it for the account of the federal government rather than engage in long negotiations with local communities. As regards public works, FWA is to become a construction rather than a financing agency.

FWA will keep title to the finished projects but will not get involved in management. In every case, it will work out some kind of a leasing arrangement with local agencies, in some cases a local community will be made construction agent of the FWA. Except in the rare instances where the locality is prepared to put up a fairly substantial part of the cost, grant-and-loan arrangements will be avoided.

Already this new approach has loosened up projects that have been hanging fire since October, and new projects are moving through on a four-day schedule.

The former field offices of PWA now become regional offices of the Federal Works Agency. As such they will take on the additional job of coordinating, and in some cases building, the utility needs of housing projects, munitions plants owned by the Defense Plant Corp., and army and navy projects. Part of this work can be handled with money appropriated for defense public works, part through the WPA, and sometimes with funds of the agency needing the utilities.

Although the tendency is to center the work in the federal government, decentralization of the federal machine itself is an objective. Projects will still have to be approved in Washington, but beyond that it is expected to leave most of the decisions to the field and to award most contracts in the field.

A somewhat similar philosophy of federalization is being applied to thinking about the war roads program. It seems probable that an increasing proportion of such jobs will be handled directly by the Public Roads Administration rather than through the states.

All of these trends add up to making the Federal Works Agency much more the chief federal construction unit than it has been as yet. To the extent that this trend develops it appears likely that engineering and construction activities now handled elsewhere in the government will gravitate toward FWA. Obvious candidates might be the Bureau of Reclamation, the civil functions of the War Department, perhaps even munition plant design and construction for the Defense Plant Corp. and military construction for the army and navy. But these are still possibilities for the future rather than immediate prospects.

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End Pascagoula toll

The last remaining toll bridge on U. S. Highway 90, in Mississippi, will become a free crossing when a 50 cent toll collection per car is lifted Sept. 1 on the Pascagoula River bridge near Pascagoula.

The Mississippi state legislature recently passed a bill lifting the toll. According to figures presented to the Senate, the bridge has returned $1,625,000 in tolls collected, completing retiring bonds issued for its construction by Jackson county, paying for its maintenance, and supplying a basis for financing county bonds issued to build industrial plants, and for other purposes. The Mississippi highway department will be responsible for maintenance of the structure.

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NHA chief begins organization task to put agency in full operating order

Blandford faces many problems of personnel and policy in transforming Agency from plans to actual work.

Senate confirmation early this week of John B. Blandford's appointment as administrator of the new National Housing Agency permits work to start on the actual organization of an agency which now exists only on paper. Of the three units in NHA, the Federal Housing Administration and the Federal Home Loan Bank Administration are practically unchanged except that they take orders from Blandford instead of Jesse Jones.

Blandford's big job will be to get the construction unit—the Federal Public Housing Authority—working. This is, in its first aspects, a personnel problem. Nearly a dozen agencies have been building houses, many of them combining this job with others that have not been transferred to NHA. The President's executive order gives Blandford power to take over as many men as he wants who have been working on house-construction.

It is assumed that the new centralized set-up will require less manpower than the former loose arrangement, so that Blandford will have considerable freedom to pick and choose. For the moment, no one in the former housing agencies knows whether he goes over to the FPHA or stays where he is. Only the routine jobs in connection with the housing program are now being done, and all decisions are being deferred until things settle down.

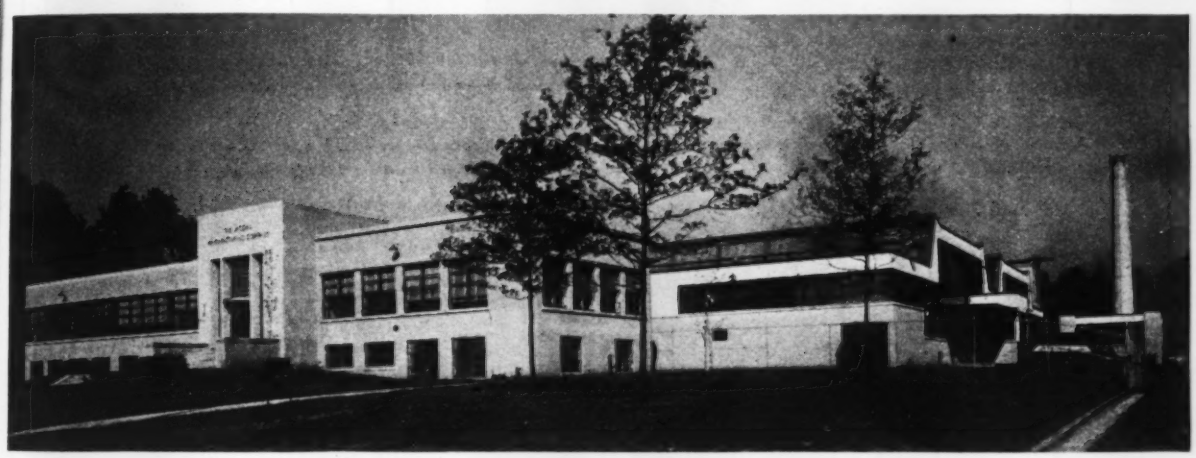
Blandford will also have the task of working out an organization chart for FPHA. At present it is merely a name and a job—the work of building all housing constructed with public funds.

Finally, a host of basic policy questions have been reopened by the housing shake-up. Perhaps the most important of these, from the standpoint of construction, is whether war housing is strictly an emergency job aimed to meet a specific temporary need or whether it is an adaptation to war conditions of a long-range public housing program. Until late last year there was no clear decision on this point—a point which affects many vital questions of house design, prefabrication, site selection and relations between publicly and privately financed housing.

When Gen. Philip Fleming and his assistant, Baird Snyder took over the job a few months ago a clearly evident determination to get houses built regardless of obstacles began to develop. It showed in a new emphasis on prefabrication, in standardization of design, in rapid, almost casual, site selection.

Now the whole question is thrown open again. First indicator of the policy to be followed is likely to be the choice of a permanent head for FPHA. Leon Keyserling, who has been acting head of USHA since Nathan Straus resigned, is now acting commissioner of FPHA. He is a protege of Senator Wagner, author of the slum-clearance housing law, and the Senator is pushing him for the FPHA job.

Keyserling's appointment would indicate renewal of a long-range attitude toward the program; he has generally been more concerned with the sociological than the engineering aspects of housing. Although there is talk that Snyder may get the job, it appears probable that he will stay in FWA. There is some likelihood that Blandford will draw on his former associates in the TVA for a commissioner of FPHA.



Planned to coordinate war production facilities

Designed to facilitate the speed-up of war production schedules, the new Connecticut plant of Jacobs Manufacturing Co., efficiently combines three divisions—office space, manufacturing area and power plant.

The two-story office building (left foreground) is in reality a basement and first floor structure, this arrangement having been made possible by a sloping hill-side lot. The manufacturing area (at right center) is located about halfway between the basement and first floor elevation of the office building. A half-flight of steps leads from the basement and from the office building to a passageway connecting the two structures, thus providing easy access to and from the office and manufacturing sections. The power plant is at the extreme right.

The office building of brick and steel construction with concrete slab floors on metal joists, including basement, has a floor area of 11,088 sq. ft. On the first floor are the engineering, drafting, production, accounting and executive offices, with lockerrooms, toilet rooms and employees' lunchroom in the basement.

The manufacturing unit has a floor area of 40,000 sq. ft. The walls are of brick to the sill line, which is 5 ft. above the floor elevation. A band of continuous steel sash above the side and end walls, and two glass-inclosed roof monitors running the full width of the structure, provide ample daylight illumination.

Interior columns of the manufacturing unit are spaced 40 ft. apart, from east to west, and 66 ft. apart, north and south. The clearance from floor to the bottom chord of the steel roof trusses is 20 ft. The roof is metal deck, covered with a layer of composition, and the floors are concrete, topped by wood block.

The plant was designed by Albert Kahn Associated Architects and Engineers, Inc. of Detroit, Mich.

Soil-cement runways for heavy bombers

C. H. McLaughlin
McLaughlin Air Service, New York

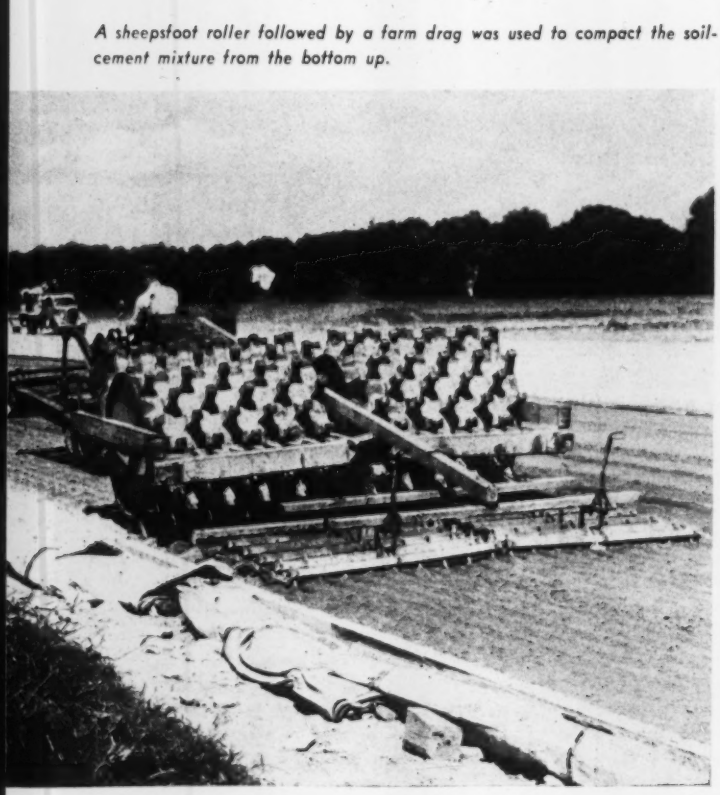
Three runways were completed recently in fast time to make a flying field where bomber and fighter planes turned out at an adjoining airplane plant can be tested before delivery to the government. Each runway is surfaced with a soil-cement mixture 100 ft. wide and 3,000 ft. long, and clearing the land was extended beyond the ends of the runways to 3,450, 4,600 and 5,100 ft., respectively, to facilitate safe use of each runway under the prevailing winds in the region. A 500-ft. taxiway between the plant and runways was included in the work.

During the grading operations all soil not suitable for the surfacing was removed from the runway areas. For the processing, an amount of cement equal to 10 percent of the top 6-in. of the runway was added. Specifications called for a density of 112 lb. per cu. ft., and the optimum moisture content was set at 13.5 percent. In all, 102,300 sq. yd. of runway surfacing was processed at an average rate of 4,260 sq. yd. per 8-hr. shift, work being carried forward on three 8-hr. shifts per day. Four 5-kw. light plants gave excellent illumination for the night work. Maximum yardage per hour was 700, and the largest single stretch paved was 19,333 sq. yd.

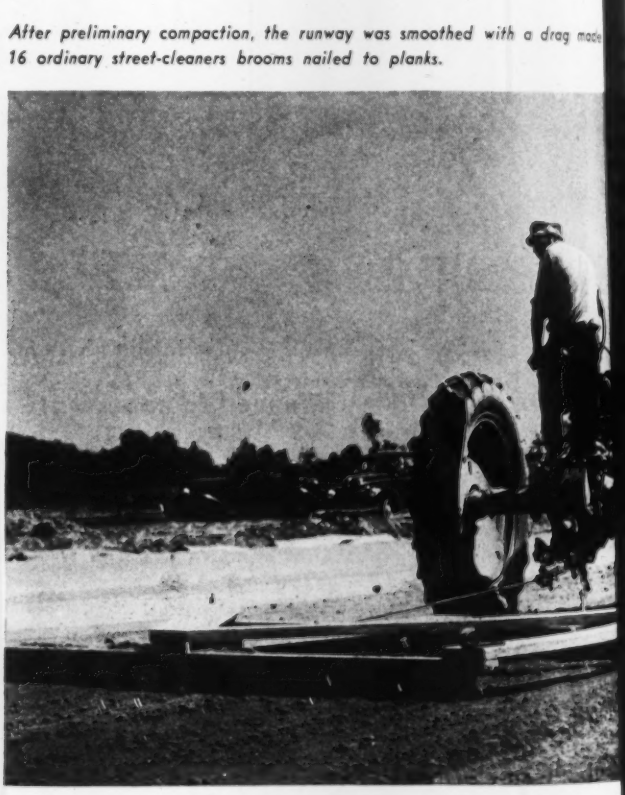
Major operations in the processing are

Funnels improvised on the tail of the cement truck made it possible to place three [illegible] simultaneously at fixed intervals with a minimum of dust and no ground crew.

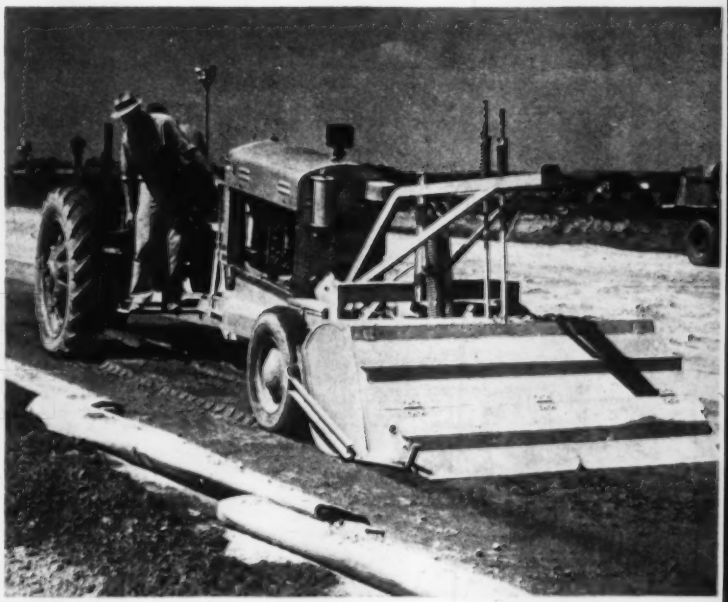
A sheepsfoot roller followed by a farm drag was used to compact the soil-cement mixture from the bottom up.



After preliminary compaction, the runway was smoothed with a drag made 16 ordinary street-cleaners brooms nailed to planks.



After the cement had been distributed in piles it was spread evenly over the surface by a wooden drag hauled by a farm tractor.



Tines revolving at 450 rpm., under a hood that keeps the soil from being thrown into the air, were used to pulverize the soil to a depth of six inches, mixing in the dry cement in a first pass and the moisture in a second operation following sprinkling. A small hand guided tiller of similar type was used along header boards and for the curved sections of runway at the intersections. Ordinary road sprinklers were used to add the moisture.

rolling was with a 10-ton roller. The finished surface was unharmed by 15-ton trucks that ted over it hauling materials from some of the final grading operations.

shown in the accompanying illustrations. The work was done principally by local farmers using farm equipment, much of it owned by the operators. Labor costs were moderately high due to the fact that the operation was near a large city. Five specially built pulverizers were used for both dry and wet mixing, two 1,000-gal. sprinklers provide the moisture, compaction was accomplished by one sheepsfoot roller, and final rolling was done with one rubber-tire roller and one tandem smooth-wheel roller. Other equipment included one broom drag, two spike-tooth harrows, five farm tractors and one small crawling tractor, and an orchard-type cultivator for scarifying.

The contractor's bid for the whole project, including grading and miscellaneous operations such as removing farm buildings, was under $150,000. Surfacing cost 70c. per sq. yd., which included supplying sand and hauling and placing 24,000 cu. yd. of borrow fill.

The general contract was held by C. T. Burkett Construction Co., Vineland, N. J. and D. W. Winkelman Co., Syracuse, N. Y. A. C. Shearer, an authority on soil-cement construction, was superintendent for D. W. Winkelman Co. The writer's firm acted as engineers for the owners.

Transport in war period dominates Atlantic States highway meeting

Thomas H. MacDonald lays before North Atlantic highway officials the urgency of studies of the load that transport of war materials will put on their highways

The need for fast work in determining the amount and location of traffic resulting from the nation's expanding war effort was laid before highway engineers assembled in Philadelphia last week for the 18th annual convention of the Association of Highway Officials of the North Atlantic States by Thomas H. MacDonald, head of the Public Roads Administration. Speaking with unusual vehemence, Mr. MacDonald said that the only way in which those charged with directing the nation's war effort can get a clear understanding of the key position of highway transport in the nation's present emergency is through the presentation of evidence of the great extent to which the movement of men and materials to and from war industries is affected by the adequacy of the highway system and by the availability of motor transport. Mr. MacDonald urged the highway department to set their planning staff to the collection of this data.

A survey of the load that the defense effort is going to put on the highways of Michigan already has been made. It was found that at 70 percent of the 749 defense plants in that state, half the incoming material came by truck and that at 13 percent of the plants all was handled in that way. Shipments of completed products out of those plants either to the military forces or to other plants show that half the material moves by trucks from 76 percent of the plants and all from 15 percent. As to mass transportation of persons, Mr. MacDonald said that ten million employees will be needed to meet the expansion of defense plants that is yet to come and that this number cannot be met by mass transportation facilities. There are not sufficient rail, bus or trolley facilities to move these employees to and from the plants; the bulk of them must move in private automobiles.

Because of this great number of people that must be moved in motor vehicles, and because of the vast amount of materials that must be handled by truck, Mr. MacDonald said that transportation authorities are concerned lest conversion of the motor vehicle industry to war production be carried to the point where there is a lack of equipment to handle the men and materials for the duration of the war effort.

As to the roads themselves, Mr. MacDonald said that it is essential that highway authorities in Washington have the pattern of the movement of materials to and from defense plants, especially the plants being built in the present decentralization move, in order to determine the extent and location of work that must be undertaken. Mr. MacDonald said that the Public Roads Administration finally has succeeded in getting from the War Production Board a statement to the effect that where stocks of supplies needed for highway work can be obtained without priorities, the use of these materials will not be opposed by the board.

More detail of Michigan's survey of war traffic were given by G. Donald Kennedy, head of the Michigan Highway Commission, at a later session of the convention.

Emergency road systems

Another talk that attracted much attention was that of Billings Wilson, assistant general manager of the Port of New York Authority, who is chairman of the Metropolitan Defense Transportation Committee. The area served by this committee includes part of New York, New Jersey and Connecticut. Mr. Wilson told of the work of that committee in collecting and marking two secondary routes parallel to each main military route that can be used by the civil population when the main military routes are taken over for war purposes. (See *ENR*, Feb. 12, 1942, p. 236).

The committee also has laid down complete plans for the supply of the metropolitan district during emergencies, alternate delivery points having been designated for each primary food product and for basic fuel supplies. Police control points have been set up along the main approach roads from which supplies approaching the metropolitan district during an emergency can be directed to their specified delivery point.

Plans of the Pennsylvania defense authorities for evacuating people from New Jersey over Pennsylvania highways adjoining the interstate border were outlined by R. Meyers. Maps showing detours to be taken by civilian traffic have been made for the region 100 miles west

Highway bureaus make adjustments for war

Demands on highway facilities for war purposes, and the limitations imposed by priorities on many materials heretofore considered necessary to highway construction, already are making themselves felt. To facilitate adjustments that will make it possible for them to continue giving greatest possible service, highway departments of many states have taken action as follows:

The Ohio Department of Highways will turn from the construction of reinforced concrete bridges on secondary highways to the building of wooden bridges, in view of difficulty in obtaining reinforcing steel for structures of this character. Director Hal G. Sours says that the department plans to build 40 to 50 wooden bridges and will use mass concrete abutments and possibly made of sandstone rather than reinforced concrete.

North Carolina's State Highway and Public Works Commission has decided to use for its own purposes a special $3,000,000 road betterment allocation, rather than withhold that sum for its original purpose of being applied to improvements to county or secondary roads and widening or straightening projects on principal highways. Fearing that loss of revenue from gasoline taxes and motor vehicle fees might make all available funds needed to meet maintenance requirements and debt service payments, the commission voted to proceed with the immediate expenditure of $1,000,000 of the fund, and to proceed cautiously with the expenditure of the remaining $2,000,000.

In Michigan, the state administrative board has authorized G. Donald Kennedy, state highway commissioner, to purchase some 1,473,000 b.-ft. of timber of varying dimensions, salvaged from the dismantling of a dock at Escanaba. The timbers will be stored at strategic points for emergency repairs and replacements on roads, used for construction of temporary buildings on access roads and also for the construction of a ferry dock at the St. Ignace Causeway on the north shore of the Straits of Mackinac.

With loss of highway revenue looming, the Colorado Department of Highways has announced that only road projects absolutely essential to the national war effort will be undertaken this year. Charles D. Vail, state highway engineer, announced that the state will spend approximately $2,000,000 on maintenance of highways and will probably be forced to make a 25 percent reduction in its staff during the next few months.

State highway officials in Oklahoma announced a retrenchment policy which will cut its maintenance department by about 250 employees and include reductions in other departments. Maintenance crews were cut from four to three men and all horsedrawn graders abolished.

of the Delaware. Routes to main cities are to be marked with temporary green signs.

More diversion possible

A warning to state highway departments to be on the alert against increased diversion of highway funds was sounded by I. Lamont Hughes, Pennsylvania Secretary of Highways, at the opening session. Mr. Hughes said that a proposal to divert $7,000,000 already has been made in the Pennsylvania legislature on the assumption that all highway funds would not be spent because of the curtailment of highway work caused by the war. He urged that all available funds be put into roads to reduce maintenance and make them better able to stand up under the anticipated heavy traffic of the war period.

Thomas C. Frame, chief engineer of the Pennsylvania Department of Highways and president of the association, in his presidential address, said that highway departments are being kept from doing their utmost for the war effort by lack of knowledge of what is wanted of them. He called upon the Administration to tell the highway departments specifically what is wanted in the way of roads. The change from a defense status to a war status has scrapped most of the plans for work on the strategic network already made by the highway departments and now that they are losing men rapidly due to their going into service or the calls of war work, he said that the highway departments will find it difficult to make new plans with their depleted staffs.

Mr. Frame emphasized the need for examining highway operating costs at this time to see where economies can be made so that the anticipated curtailment of income will not seriously affect the ability of highway departments to meet maintenance needs and new construction required for the war effort.

Too much speed

Rapid increases in motor-vehicle speed potentialities have outmoded most of the older highways, Mr. Frame said, but added that in the light of the accident records on the Pennsylvania Turnpike, highway engineers should use their influence to keep the automotive industry from building more cars that encourage driving at very high speeds. The accident record on the Turnpike before a speed limit of 60 mph. was set up was higher than the average for all highways in Pennsylvania, indicating, Mr. Frame said, that neither the drivers nor the cars can safely travel at sustained speeds much in excess of 60 miles per hour.

Mr. Frame put in a good word for the much criticized three-lane road. Pennsylvania has built and still is building many miles of such roads, the cost being about half that required to make a four-lane road. A three-lane road is just as safe as any other so long as the sight distances are adequate, he said.

Mr. Frame expressed the view that highway construction can go ahead without priorities, especially rural work, and recommended that as much as possible be done where it does not interfere with the war effort.

Markham Resigns

In calling on W. C. Markham, executive secretary of the American Association of State Highway Officials, Mr. Frame noted with regret that Mr. Markham has tendered his resignation to the directors of that association to take effect as soon as a successor can be found.

Mr. Markham said that normal federal highway aid probably is out of consideration for the war period, but that fact, he said, does not mean that highway construction is out because only a little over 10 percent of the billion dollars spent on highway construction last year was federal aid. Gas tax income may be cut as much as 50 percent this year, and as fixed charges take up 28 percent of all highway income, this cut will be serious. Maintenance is going to be the big problem during the war period. In a lighter vein, Mr. Markham added that next year he would not be surprised to see the A.A.S.H.O. giving a prize for the "best patched road."

Highway work in Canada

What Canada is doing in the way of highway work during the war emergency was described by Theodore G. Morgan of the Canadian Good Roads Association. Canada's major effort is concentrated on the completion of the last link in the Trans-Canada Highway, on completion of the Queen Elizabeth Way between Toronto and the Niagara frontier, and completion of a limited-access highway from Montreal south to the New York state border.

Signs in the war period

What can be done in the way of maintaining signs and pavement markings during the war period was outlined by Charles R. Waters, district engineer of the New York highway department in an account of how New York has put the maintenance of signs on a production basis. During the war period it will be necessary to go back to old paint vehicles such as linseed oil and there will be a

Photo by British-Combine

Military bridges assembled rapidly from standard units

Just as the modern mechanized armies contrast sharply with those of the last war, bridges to carry the modern vehicles of combat reflect technological changes. Here we see a demonstration of military bridge building by Canadian engineers in England, where a 96-ft. span structure was completely assembled from standard parts. Contributing to the speedy erection was the use of framed steel box units to form the supporting piers. As shown in the photo, as well as the one on the cover, the box units all are of the same size, and can be arranged in multiple groupings to build up piers of varying height and plan dimensions. The boxes are strengthened with internal braces, which give them great rigidity despite their lightness in weight. The main span box truss members are also assembled from standard sections in the field. In the view above, pre-assembled floor units are being laid.

scarcity of some pigments such as yellow, but the net result will not be serious. Marking highways for blackout periods, however, Mr. Waters stated, is a problem of major importance for highway departments. He outlined some of the possibilities of fluorescent and phosphorescent paints. Handling of traffic lights during blackouts also is another problem that has not yet been solved. He noted that the General Electric Co. is studying the use of very low wattage lamps for road lights.

At a later session a representative of the War Production Board gave added information on the paint situation and reported that interim specifications for traffic paints have been prepared by the National Bureau of Standards and can be obtained from the bureau in Washington. He said that all synthetic vehicles and pigments are out, also that the growing scarcity of yellow pigment makes necessary a reduction in the amount of such pigment to be used. Oxides of lead and zinc still are available for bridge paint, and possibly some titanium oxide.

Unreinforced concrete

Studies made in New York state on the design of concrete pavements without the use of steel for reinforcing and dowels were reported by Elmer C. Lawton. These studies indicate that if embankments are built by the use of normal stabilization methods, use of a 10-in. concrete slab will be satisfactory for main roads, and a 9-in. depth for secondary roads. Thickened edge design can be used if preferred. In such pavements, expansion joints should be spaced 400 ft. apart and dummy joints should be at 20 to 25 ft. intervals. Savings of 40 tons of reinforcing per mile can be made in this way.

As to load transfer devices at the joints, Mr. Lawton said that they should be retained. They require such a relatively small amount of steel as to make no difference in the war effort, yet their elimination calls for an uneconomical increase in the thickness of the pavement.

Flight strips

Current developments with respect to construction of flight strips adjacent to highways were reported by Lt. Col. Stedman S. Hanks, U. S. Army Air Force. Runways for flight strips should not be less than 150 ft. wide nor less than 3,000 ft. long for the use of pursuit planes, and not less than 4,000 ft. for all other military aircraft. However, Colonel Hanks said that in selecting the location for such flight strips it should be recognized that these are minimum requirements and that an ideal flight strip would have dimensions more like 800 ft. wide and 8,000 ft. long.

Methods for handling the location and construction of flight strips are only now taking final form. Construction is to be under the direction of the Public Roads Administration, technical advice as to number, location, specifications and general nature of the strips being supplied by the Army Air Force. Four initial allotments of $2,000,000 have been made for each of the four air force areas in which the country is divided, and the air force engineers in each area will coordinate the selection of sites through the district engineers of the PRA in their respective regions.

New Officers of the Associated General Contractors

M. W. Watson, retiring president of the Associated General Contractors of America, hands the gavel of the office to Dan W. Kimball, incoming president, at the recent AGC convention in Indianapolis. Oscar B. Coblentz, new vice-president looks on with approval.

Maintenance under bombing

How highways in Great Britain were maintained under bombing was described at the closing session by Walter D. Binger, chairman of the National Technological Civil Protection Committee, who was sent to England by the government last year to study the effect of bombing on structures.

Among the papers not directly related to the war effort was one on the maintenance of bituminous macadam pavements in Massachusetts by J. E. Lawrence, maintenance engineer for that state, and one by E. T. Baker, senior contract engineer of the Pennsylvania department, on the reconstruction of old pavements on heavily traveled highways. Methods for the economical handling of landscaping along highways were described by Robert S. Green of the New Jersey State Highway Department. Carl Izzard, associate highway engineer of the Public Roads Administration, outlined methods for reducing erosion of highway ditches through the proper design of drainage facilities. G. A. Rahn, senior research engineer, Pennsylvania Department of Highways, discussed laboratory field control, showing how the right kind of control can speed the work and eliminate needless friction with the contractors.

E. Donald Sterner, commissioner, New Jersey State Highway Department, was elected president for the new year, and Herman A. MacDonald, commissioner of public works of Massachusetts, was elected vice president. A. Lee Grover was reelected secretary-treasurer of the association. Total registration, including members, guests and exhibitors, was nearly 1,200.

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Rapid progress being made on Central Valley projects

Concrete pouring is almost completed on the Shasta powerhouse of the Central Valley project in California, Walker R. Young, assistant chief engineer, U. S. Bureau of Reclamation, told a group of California businessmen recently.

The first of the 75,000-kw. generating units is being installed in the powerhouse, Mr. Young said, and the dam itself—well ahead of construction schedule—is 68 percent completed. In the delta area, the Contra Costa Canal is in operation for a distance of 29 mi., serving industrial, domestic and agricultural consumers, while an additional 15 mi. of canal is completed or under construction. Friant Dam, in the south San Joaquin Valley, is 95 percent complete and water now stored in the reservoir ("Millerton Lake") extends some 6½ mi. above the dam site.

It is expected that the first Shasta power will be delivered early in 1944.

Engineers attend bombardment school

Urged to form fast-moving units which would converge on scenes of disaster in much the same manner as fire, police and other emergency services, more than 250 civil engineers met in New York from Feb. 16 to Feb. 24 in a national training conference on aerial bombardment protection.

The conference, called to provide engineers with a symposium of the latest developments and theories for protection against aerial attack, was sponsored by the Office of Civilian Defense, in cooperation with the U. S. Office of Education and New York University's College of Engineering. Sixty civil engineering professors from colleges throughout the nation and nearly 90 engineers and architects, representing public works and building departments of cities and large corporations, attended the sessions.

Addressing the opening session Feb. 16, Mayor F. H. LaGuardia, of New York, urged the organization of units which could converge on the scenes of disaster to provide expert instructions for salvage and rescue work. He also urged the creation of a "reservoir of plans" for public works programs after the war, to take up the slack of post war adjustment.

Other speakers at the conference, which closed Feb. 24, included Lt. Col. Milton C. Mapes, of the Office of Civilian Defense, Washington; Maj. R. G. Butler, Jr., of the office of Chief of Ordnance; Sherwood B. Smith, fortification section, Corps of Engineers, U. S. A.; Walter D. Binger, chairman, National Technological Civil Protection Committee; Kirk Reid, General Electric Co.; Samuel Hibben, Westinghouse Electric & Mfg. Co.; Billings Wilson, assistant general manager, Port of New York Authority; Prof. Harold E. Wessman and Prof. William A. Rose, of New York University. Dean Thorndike Saville of the College of Engineering of New York University presided at the opening session.

Prof. R. B. ALLEN, University of Maryland (left) listens while KIRK REID of the Nela Park Laboratories of General Electric Company, points out features of blackout demonstration equipment.

THORNDIKE SAVILLE, dean of the New York University College of Engineering, stands at the rostrum to open the first session of the aerial bombardment conference.

B. H. MERTON, acting resident engineer, Department of Borough Works, Bronx, New York City (left) confers with W. L. MALONEY, consulting engineer of Spokane.

P. E. SONESON (left) Asst. Prof. of architectural engineering, Purdue University; W. R. BENFORD (center) Asst. Prof. of civil engineering, Brown University, and S. W. MacCONNELL, architectural engineer of Warwick, R. I.

A. P. APPANAITIS, fire marshall's office, Westville, Ill.; SAMUEL T. CARPENTER, Asst. Prof. of civil engineering, Swarthmore College; Prof. E. F. TOTH, University of Illinois and R. A. CAUGHEY, professor of structural engineering at Iowa State College.

HAROLD E. WESSMAN (left) and WILLIAM A. ROSE, professors at New York University's College of Engineering, are leaders in development of the bombardment protection course of instruction.

MEN AND JOBS

J. J. Greenleaf, of Richmond, Ky., has been appointed chairman of the Kentucky Public Service Commission, succeeding **John Kirtley,** of Owensboro, who resigned recently. **George S. Wilson,** of Owensboro, was appointed to the commission to fill the vacancy left by Mr. Kirtley's resignation.

B. A. Nangle, city engineer of Belle Fourche, South Dakota, since 1923, has resigned to accept a similar appointment at Yankton, S. D.

C. L. Darr, city engineer of Marshfield, Minn., since 1936, has enlisted in the U. S. Naval Reserve with the rating of first class petty officer in the construction division.

Ralph Reed, city engineer of Watertown, S. D., and vice president of the South Dakota Society of Engineers and Architects, has resigned to accept a position with the Corps of Engineers at Fort Peck, Montana.

Capt. Carroll L. Mann, Jr., of Raleigh, N. C., has been appointed acting area engineer in charge of all construction at Fort Bragg, Fayetteville, N. C.

R. Walker Martin, of Lexington, N. C., an engineering graduate of Wofford College has been appointed assistant director of civilian defense in North Carolina.

B. W. Coulter, prequalification engineer for the Texas State Highway Department, has resigned that position to become associated with Brown & Root, Inc., general contractors.

Sidney H. Birdseye, topographical consultant, recently in charge of mapping of the New Wolf Creek ordnance plant at Milan, Tenn., has joined the staff of the H. K. Ferguson Co., industrial engineers and builders, as a topographical engineer.

John Kern, engineer, of Denver, Colo., and formerly with the engineering department of Broderick & Gordon, contractors, who built the Denver ordnance plant, has joined Roberts & Co., Inc., at Corpus Christi, Texas.

S. M. Ackerman, formerly an engineer with the Department of the Interior on the design and construction of water conservation projects, has been appointed assistant civil engineer and assigned to the Division of Public Health Methods, U. S. Public Health Service, at Bethesda, Md.

James H. Turner has been appointed manager and chief engineer of the Hetch Hetchy water supply, San Francisco Public Utilities Commission. He was born in San Francisco 43 years ago, is a graduate of the University of California, and has been in the employ of San Francisco engineering department since July 1922. In addition to design and construction experience on the Hetch Hetchy project, he has had engineering and legal assignments in connection with the acquisition of the Spring Valley Water Co. properties, construction of the San Francisco Exposition, and other work for the city's power and utilities engineering bureau.

JAMES H. TURNER

Harry Hansel, former Wapello County engineer, has taken a similar position in Mahaska County, Iowa. He will make his headquarters at Oskaloosa.

Michael A. Fouhy, formerly associate civil engineer at the Boston Navy Yard, has been transferred to the U. S. Navy Air Station, New York, as civil engineer and chief draftsman.

Merrill G. Grothe, of Roseau, Minn., has been named construction engineer for the Farm Security Administration, with headquarters at Milwaukee, Wis.

A. W. Green has been named sanitary engineer in the city health department at Tacoma, Wash., and will be chief of sanitation and inspection. For the past year he has been a regional engineer with the Washington state health department at Seattle.

Ulmont S. Allison, territorial engineer and assistant territorial director of the U. S. Department of Agriculture, Soil Conservation Service, in the Territory of Hawaii for the past three years, has been promoted to the position of assistant regional conservator of ration 2, Spartanburg, S. C., and made director of the soil conservation service program in Porto Rico and the Virgin Islands. Mr. Allison will make his headquarters in San Juan, Porto Rico.

The Colorado Department of Highways recently announced transfers of some department division engineers, including: **Roy J. Randall,** formerly stationed at Greeley, to Durango; **W. A. Whitney,** formerly at Salida, to Greeley; **H. L. Jenness,** formerly at Glenwood Springs, to Colorado Springs, and **Ernest Montgomery,** formerly at Colorado Springs, to Glennwood Springs.

D. W. Ward, for the past 20 years superintendent of maintenance for the Ford Motor Co., has joined the engineering staff of the War Production Board at Memphis, Tenn.

Fred Quinnell, Jr., formerly an engineer for the Montana State Highway Commission at Glendive, has been appointed district engineer at Wolf Point.

A. A. Blanc, of Fessenden, N. D. has been named WPA area engineer at Devils Lake, to replace **W. R. Spriggs,** who recently was called to active duty with the U. S. Army.

P. W. Triplett, division engineer for the Long Island Railroad, has been appointed superintendent of the Delmarva division of the Pennsylvania Railroad at Cape Charles, Va.

William S. Ragsdale, Smithfield, N. C., has resigned as Johnston County commissioner for the Regional Housing Authority, to accept a post in the engineering department of the Glenn L. Martin Aircraft Corp. at Baltimore, Md.

C. H. F. Foard, an associate city engineer of Baltimore, Md., has been named as temporary manager of the Baltimore municipal airport, to succeed **Louis M. Rawlins,** recently called to active duty with the U. S. Army.

John Sipe, formerly with the Colorado Department of Highways, has resigned to accept a position with the Corps of Engineers at Albuquerque, N. M. Mr. Sipe will be employed in the design department.

Chris J. Sherlock, director of the Alabama State Highway Department, has resigned to become an active candidate for Governor in the May primary elections. **W. G. Pruett,** office engineer, has been appointed acting director.

Lt. Col. Gordon H. Butler, of Duluth, Minn., has been named area engineer in the office of the U. S. District Engineer, St. Louis, Mo.

William F. Freeman, of High Point N. C., has been appointed consulting engineers for the town of Oxford, N. C. He was recently consulting engineer at Elizabeth City, and at Jacksonville, N. C.

Dwight Barton Betts, formerly an engineer with the J. A. Jones Construction Co. at Raleigh, N. C. has been called to active service in the U. S. Army.

Uphold utility's use of highway right-of-way

The right of the North Carolina Highway and Public Works Commission to grant public utilities the use of its right-of-way was upheld in a recent decision of the North Carolina Supreme Court on a suit for damages brought against the Southern Bell Telephone and Telegraph Co.

A resident of Buncombe County brought suit against the utility, which was using a highway right-of-way across his land. The utility company cited a judgment obtained by the plaintiff against the highway commission several years ago, which stated that the money was paid "for the right-of-way and the past and future use thereof by the State Highway and Public Works Commission, its successors and assigns, for all purposes for which the State Highway and Public Works Commission is authorized by law to subject such right-of-way." The utility also contended that it was using the right-of-way with permission of the highway commission.

Reversing a verdict in a lower court which awarded the plaintiff $1,000 damages, the Supreme Court ruled "the decree in the original condemnation proceedings established and granted a right-of-way for use for highway purposes," and said that the authority of the highway commission to authorize the use of highway right-of-way by telephone and telegraph companies is not seriously debated. The court said, however, that this authority is subject to the right of the owner of the servient estate to payment for the additional burden.

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A-E-M contracts may be lump sum or unit price

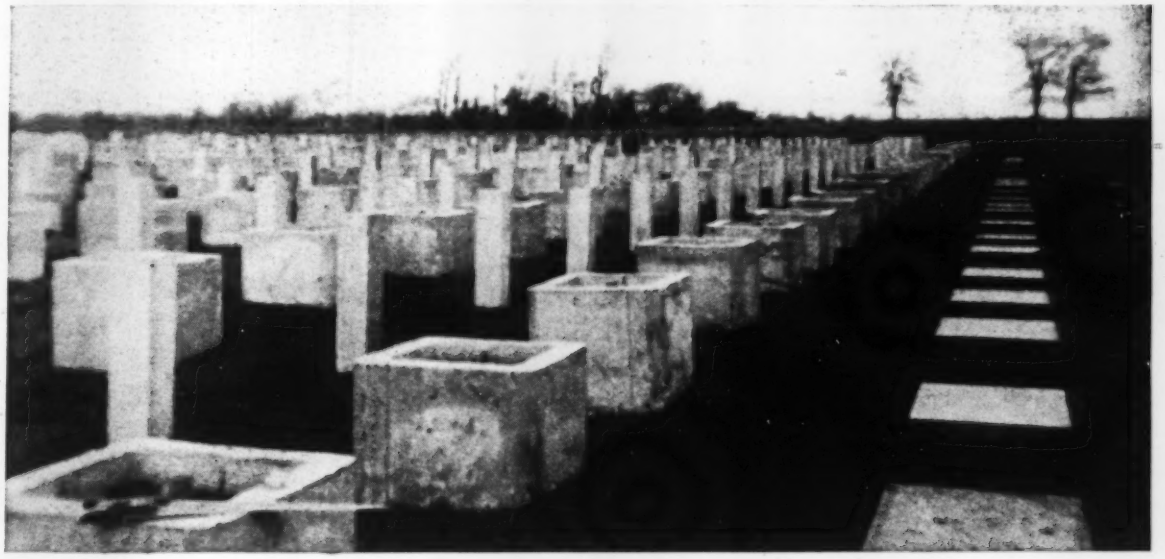
The Architect-Engineer-Manager set up for War Department construction work, (*ENR*, Feb. 19, 1942, p. 297), may involve either a lump sum or unit price contract for the parts of the work not done directly by the A-E-M organization. It was implied that only lump sum contracts were contemplated, whereas contracts may be awarded on competitive bids or by negotiation, but will be for a firm-price rather than the cost-plus type. The part of the work done by the A-E-M organization itself, however, will be on the cost-plus-a-fee basis.

Sanderson and Porter to design Allatoona project

Sanderson and Porter, New York engineers, have been engaged by the U. S. Engineers, Col. L. D. Worsham, district engineer, at Mobile, Ala., to design and prepare specifications for the Allatoona flood control and 100,000-kw. powerplant project on the Etowah River, near Cartersville, Ga. Plans call for a concrete dam about 180 ft. high and 1,100 ft. long. The project will be built at a cost of about $10,000,000.

A group of engineers, hitherto engaged in private practice, have been retained by Sanderson and Porter to handle this job under the direction of Col. William C. Lancaster and George Waesche, members of the Sanderson and Porter staff. They are, L. J. Bevan, who will prepare specifications; O. V. Karpov, who will be in charge of design; R. S. Lindquist, who will handle hydraulic machinery; R. C. Latimer, who will design the powerhouse; and R. C. Schott, who will be in charge of electrical design.

Work has been started on preliminary plans. Construction will not begin until a later date.



Cement researchers adopt graveyard motif

A concrete test specimen cemetery is one of the devices being used by a research committee of cement specialists, both manufacturers and independent engineers, in a long-time study of cement performance in concrete. Known as a test farm, the installation shown above is near Chicago and is a duplicate of one in Georgia (ENR Feb. 26, 1942, p. 318). The specimens shown represent every conceivable mix proportion and water-cement ratio, and other variables are the aggregates and the cements. The slab and column specimens represent their prototypes directly while the hollow boxes filled with moist earth are intended to simulate such structures as retaining walls. For those concretes that exhibit outstanding durability the test specimens will constitute monuments; those that fail will undeniably be tombstones.

The test program, which is sponsored by the Portland Cement Association, also involves test roads in Missouri, South Carolina and New York, in which the same mixes and cements will be used. Test structures such as bridge decks, handrails and parapets are to be built soon. Other specimens will be subjected to seawater exposure at a variety of locations. And backing up these field studies will be the most extensive series of laboratory experiments ever conducted in the cement field. Some 24,000 samples of 27 cements, whose complete manufacturing history has been recorded, have already been collected, and the program is subject to considerable enlargement. P. H. Bates, of the National Bureau of Standards, is chairman of the committee, and F. R. McMillan, director of research of the Portland Cement Association, is one of the industry representatives.

MEN AT WORK

Those in charge on the large Panama Canal project include the two above. Left to right, they are: CAPT. NORMAN J. RIEBE, chief of the engineering division, and BRIG. GEN. W. A. DAVIDSON, zone constructing quartermaster, Panama Canal Department, Quarry Heights.

George A. Gott

Although 70 years of age, MRS. KATHARINE SIMMONS is Munising, Mich., is manager of the city's waterworks. In 193 her husband was appointed manager and operator of the city's water system, and when he died in 1932 Mrs. Simmons continued his work. She did so well that officials of Munising have seen no reason for a change.

A building equipped with a circular track 161 ft. in diameter for an overhead crane is the novelty here engrossing FRED F. HALL (extreme left) of Hall & Pregnoff, designing engineers, and R. ARMSTRONG, job superintendent for the Moore Drydock Co., steel erection contractors. The heavy girders behind Armstrong's head are for the University of California cyclotron now under construction. Fred Hall is getting to be a specialist on domes—this is the second one he has designed recently.

H. SCOTT-SMITH (left), superintendent of public works at Waterbury, Conn., sees how New Orleans paves streets at the recent convention of the American Public Works Association in that city.

U. S. Reclamation Bureau photo

In the twilight hours of Nov. 14, the first bucket of concrete was poured for Keswick Dam. Present for the occasion were Resident Manager E. M. JENNETT (left) of the Atkinson-Kier Co., general contractors for the work, and C. M. JACKSON, inspector for the U. S. Bureau of Reclamation. They are standing in front of the 6-yd. bucket.

Steel fabricators join to increase service

Providing quicker and more efficient service for large construction projects, four independent structural steel fabricating companies in the Mid-west have combined their facilities without losing their individual identities.

The cooperating companies are the Clinton Bridge Works, of Clinton, Iowa, and the Duffin Iron Co., Gage Structural Steel Co., and Midland Structural Steel Co., all of Chicago. These organizations have a combined capacity of 6 to 8 thousand tons per month of fabricated structural steel. The four companies maintain an office under the trade name of "Four V Structural Steel Companies," at 37 W. Van Buren St., Chicago.

Without resorting to legal combinations or mergers, the companies have established a procedure under which any inquiry received by any one of the companies or the headquarters of the combination is referred to a conference at which a mutually-agreed course is determined. One of the group prepares and submits a proposal to the customer based upon the cost as determined at the conference, at the same time advising the customer that fabrication will be performed by one or all four of the companies. If the proposal is accepted, the company submitting the proposal enters into a contract with the customer, assuming all responsibility for its fulfillment and relieving the customer of dealings with several companies at once. The contracting company then issues a formal order to its associates, covering their proportion of the contract.

The contracting company assumes the clerical work, preparation of details, placing of mill orders, supervision of production to assure coordination of deliveries, and attends conferences with the customer and places an engineer in the field when necessary.

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Glass manufacturer to enter housing field

Acting in concert with government plans to relieve the acute housing shortage, and to keep its own employees on active payrolls, the Libbey-Owens-Ford Glass Co. expects shortly to begin producing several hundred prefabricated house per month at its remodeled Ottawa, Ill., plant.

Approximately 600 employees, formerly engaged in the production of laminated glass for automobiles, will be employed in the new work.

The glass company will fabricate the houses for sale and delivery to the government at Ottawa. Government-selected contractors will pick up, deliver and erect the fabricated homes at designated places. Houses will include three typical floor plans of one, two and three bedrooms. While free of unnecessary trimmings, the houses will be insulated, exteriors and interiors well finished, and equipment items will be of good quality. The plan includes large window areas for proper ventilation.

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Iowa engineer exam set

The Iowa State Board of Engineering Examiners will hold an examination for the practice of professional engineering at the State House, Des Moines, Mar. 10-11. Examinations for land surveyors will be held at the same place Mar. 12.

Mud Mountain Dam storage for irrigation use studied

Studies looking to the use of water stored behind Mud Mountain Dam on the White River near Enumclaw, Wash., for irrigating 200,000 acres of land—most of which already is under cultivation—were considered during a recent meeting of the Western Washington Reclamation Institute, at Seattle.

Although preliminary land classification has been completed, it is not contemplated that the plan would be put into effect until after the war. The dam, which was designed for flood control, is scheduled for completion in November, 1942. Since the structure has the necessary facilities for bypassing water, engineers believe it would remain only to construct ditches and flumes to the Puyallup and White River valleys to make possible delivery of a gravity flow which would add enormously to the productivity of the area.

The exact extent of the work necessary to make the dam suitable for irrigation purposes has not been estimated.

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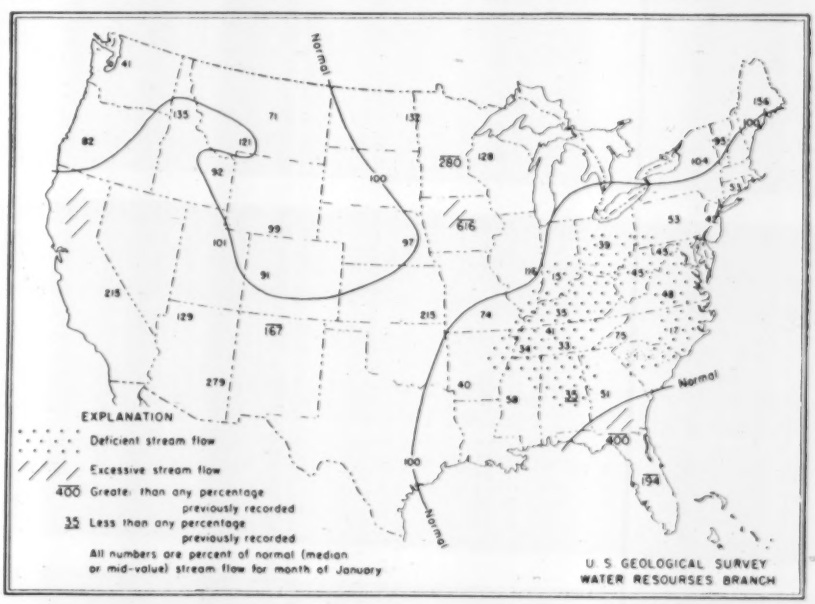
Salvage road bureau scrap

Cooperating with national plans to salvage scrap for reuse in the war effort, the North Carolina Highway and Public Works Commission has to date shipped 24 carloads of scrap metal, weighing about 2,000,000 lb.; five carloads of steel oil drums, and four carloads of old rubber, including 3,835 discarded tires. The scrap was gathered from highway maintenance and repair depots throughout the state and shipped as fast as assembled into carload lots.

Stream flows in mid-west, southeast are unfavorable for power production

The trend of stream flow for January was generally less than normally favorable for power production or storage in most of the Ohio and Tennessee River Basins and southeastern States, according to the monthly report of the Geological Survey. Throughout most of the West, upper Mississippi Valley, northern New York and northern New England, stream flow either approached or exceeded normal.

Although deficiencies in precipitation were nearly nation-wide during January, above-normal temperatures during the last half of the month released water from snow in sufficient quantities to maintain normal stream flow in the northern tier of states. The amount of storage in New England is still considerably below normal. In the southeast the gains in reservoir storage in some reservoirs were offset by loss in others and in general total power storage remains low in volume.


Normal
Normal
Normal
EXPLANATION
Deficient stream flow
Excessive stream flow
400 Greater than any percentage previously recorded
35 Less than any percentage previously recorded
All numbers are percent of normal (median or mid-value) stream flow for month of January
U. S. GEOLOGICAL SURVEY
WATER RESOURSES BRANCH

Air raid plans developed for Chicago public works

Detailed plans to protect, maintain and repair public works facilities in the event of an air raid have been completed in Chicago following the recommendation by Oscar E. Hewitt, commissioner of public works, that all department heads outline and organize emergency procedures. It is expected that drills will be held soon to assure proper training and familiarity with the plans.

Each departmental report describes a hypothetical air raid with resultant assumed damages, and then develops the manner in which personnel and equipment would be dispatched to cope with the situation. Included with the reports are organization charts of personnel, all the names, addresses and telephone numbers of department employees, lists of equipment and its location, and an estimate of additional equipment that may be needed.

Extracts from the report of the bureau of sewers, which will be published in next week's issue, outline an effective procedure for organization of emergency sewer repairs.

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Stiffening truss planned for Whitestone Bridge

Bids have been asked on March 12 for adding a stiffening truss above each of the existing stiffening girders on the Bronx-Whitestone Bridge which spans the East River in New York City. In the same work the sidewalks on the structure will be eliminated and the roadway widened from 27.5 to 30.8 ft. to accommodate safely three lines of traffic in each direction.

Stiffening trusses will consist of a top chord 14 ft. above the existing 11 ft. deep girders with a vertical at each cable hanger point, 39.5 ft. c. c., and a diagonal in each panel. The present stiffening girder will serve as the bottom chord of the truss, making an overall depth of 25 ft.

The revised roadway will retain the 4-ft. wide center mall. The new width will be attained on the suspended span by moving the roadway barrier curb out into the present sidewalk area. On the steel approach spans this same procedure can be used on one side but on the opposite side, where there is now no sidewalk, it will be necessary to extend the existing cantilever brackets which now carry part of the roadway outside the two main longitudinal girders, which are 45.5 ft. apart. The concrete approach ramp will be windened by using the sidewalk area where it exists and adding a new concrete section on the opposite side.

The work will require 1,825 tons of structural steel for trusses and 785 tons of structurals for other uses. About 190 tons of reinforcing and 1,600 cu. yd. of concrete will be used. A minimum 14-ft. wide roadway will be maintained in each direction during the construction period.

Estimated cost $800,000

An A-2 priority has been obtained for structural steel shapes and reinforcing and A-1-j for plates. Completion date required by the contract is Dec. 19, 1942. Cost is estimated at $800,000 of which a little more than $100,000 is for widening the roadway.

WASHINGTON HIGHLIGHTS

A NINE-BILLION DOLLAR super-highway construction program would be authorized by a bill introduced by Senator Reynolds, chariman of the military affairs committee. The bill would authorize a special commission—composed of representatives of the House, Senate, and American Automobile Association — to build as soon as it found labor and materials available four cross-country roads 300 ft. wide, two running east and west and two north and south. Bills of this same character have been introduced intermittently for the past several years, but have been consistently opposed by the Public Roads Administration and the administration, and in general have not reached fruition.

FIRST of the $10,000,000 worth of flight strips authorized by Congress in last year's emergency road bill will be put under construction within a few weeks. The flight strips, to be located near highways as emergency landing fields, will be built with federal funds by the state highway departments.

EXPENDITURES for engineernig studies now on public works projects to be undertaken after the war would have been authorized by a bill—the Wagner-Beiter bill—which was defeated in the House last week by a two to one vote.

NAVY CONTRACTORS on the Pacific bases whose employees were captured or are missing as a result of enemy action have been paying $100 a month to the next of kin since Jan. 1 at the direction of the Navy Dept., it was revealed this week.

THE BUREAU OF STANDARDS simplification program for pipe fittings, reducing the number of types from 8,500 to less than 3,000, has been made mandatory by WPB under the plumbing supply order, L-42.

USHA wants data on electrical wiring methods

Looking toward conservation of strategic materials, the United States Housing Authority has appointed a committee under the chairmanship of L. Alan Sharp, electrical engineer of New York, to formulate a war emergency policy concerning electrical wiring methods, particularly for cantonments and housing projects, to be recommended to or adopted by the various federal agencies.

Factual information, brief or authentic data in condensed form bearing on conservation of strategic materials, tools, dies and production facilities, stocks and availability of materials, safety to life and property, ultimate effect upon peacetime standards and installation rules for new wiring methods from recognized industry organizations should be made available to this committee, addressed to L. Alan Sharp, chairman, Working Committee Interior Wiring Methods, Room 3316, N. Interior Building, Washington, D. C.

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Health service engineers' examinations scheduled

Examinations for appointment as Assistant Sanitary Engineer in the regular commissioned corps of the U. S. Public Health Service will be held in five cities May 11, according to J. K. Hoskins, chief, sanitation section. Test cities will be Washington, D. C.; Cincinnati, O.; New Orleans, La.; Kansas City, Mo. and San Francisco, Cal.

Candidates must be not less than 23 years nor more than 32 years of age, and have a degree in sanitary engineering. Compensation, including allowance for quarters and subsistence, will be $3,158 and $2,699 for officers with or without dependents, respectively.

Applications should be addressed to the Surgeon General, U. S. Public Health Service, Washington, D. C.

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University instructors recruited from industry

So great has been the demand for young engineers in Canada that junior members of the staff for the Faculty of Applied Science and Engineering of the University of Toronto have had to be recruited on a part time basis from major industries and utilities of the Toronto area, according to Dean C. R. Young.

Twenty-three are now employed in this way as demonstrators, generally assisting in laboratory work and giving on an average six hours per week of their service by special arrangement with their employers.

Civil course at Columbia radically revised

Undergraduate studies in civil engineering at Columbia University, New York City, have been placed on an entirely new basis in accord with a philosophy that seeks to fit the student to cope with some of the more recent trends in engineering practice, particularly in the structural field.

Believing that too much of the essential training in statically indeterminate analysis, including the structural theories developed by aeronautical science, has been left to graduate studies, the Columbia authorities have put courses of this type into the undergraduate curriculum, while at the same time abandoning water supply and sewage disposal as courses of undergraduate study. However, a brief course in the elements of hydrology and meteorology has been added to assure the student of necessary fundamentals in the water engineering field. Another change is to consolidate three courses in railway and highway surveying and design into a single course on the elements of transportation engineering.

Announcing the changes, Prof. J. K. Finch emphasizes that the objective is to acquaint the student with techniques which will be developing about the time he graduates and enters practice, and thus fit him for applying his knowledge of theory to actual field problems.

Canadian power shortage

Southern Ontario, Canada, will face a power shortage next winter of not less than 150,000 hp. and possibly more than 300,000 hp., it has been announced by T. H. Hogg, chairman and chief engineer of the Ontario Hydro Electric Power Commission.

Only immediate remedy, pending possible expanding of the Commission's power generating resources, will be restrictions on sign and store lighting and possibly on street lighting and other forms of domestic use. Mr. Hogg warned that such savings would not in themselves be sufficient to provide necessary power to meet war industry needs.

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Seek WPA labor use

A change in existing law, to permit the use of WPA workers under direct supervision of county road commissions on county highway maintenance work, was recommended at a recent meeting of the Michigan Association of Road Commissioners and Engineers at Ann Arbor, Mich. The association said that in view of wartime restrictions and possible loss of revenues, the county road commissions can no longer continue sponsoring new construction projects. However, employment may be found for WPA workers unable to secure industrial employment, in maintenance work on county roads.

Plan pre-fabricated house construction course

A course in engineering and construction, featuring materials and methods used in preparation and construction of pre-fabricated buildings is being planned for addition to the curricula of the North Carolina State College School of Engineering, at Raleigh, N. C.

Developed by Dean Blake R. Van Leer of the School of Engineering, and C. R. Bramer, associate professor of structural engineering, a course has been approved by the executive committee and the faculty of the school. It must still be approved by the faculty council of the college.

Due to the increased use of pre-fabricated material in the construction of small homes and other buildings, Dean Van Leer said, there is considerable demand for special training in this field.

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San Vicente Dam reported near completion

Excavation at the site of San Vicente Dam, being built to augment the water supply of San Diego, Calif., was reported as 80 percent complete in the latter part of February, and erection of concreting and screening plants had been nearly finished. It was expected that concreting would start in about a month.

Timber bridge is answer to steel shortage

Faced with the coincident shortage of steel and need for replacement of a highway bridge, the Tuscaloosa (Ala.) County Board of Revenue answered the problem when it recently opened a creosoted timber bridge over North River, about 10 miles north of Tuscaloosa. The total cost of the project, including piers but excluding approach realignment, is about $43,000, for an average cost of $5.35 per sq. ft. of roadway, at war-time prices.

Designed for an H-15 loading, the new bridge is 33 ft. 6 in. overall, has a 24-ft. roadway and consists of standard trestle bents of 15-ft. span each and two identical 90-ft. truss spans. The deck and sub-flooring are supported by 6x16-in. stringers, 30-in. on centers. Trusses have 8x12-in. chords, 6x8-in. verticals and 2x12-in. diagonals in pairs. Four inch metal split-ring connectors are used on all timber-to-timber connections.

Main trusses use timber members with steel gusset plates and 4-in. metal shear connectors. Truss centerline span is 90-ft. and the centerline depth is 15-ft. Lateral bracing under the floor is the "K" type.

The bridge was designed by Prof. Donald A. du Plantier, associate professor of structural engineering at the University of Alabama. Field work was supervised by Powell Baker, WPA engineer and Woolsey Finnell.

Brooklyn-Battery tunnel to go ahead utilizing materials now on hand

Cast iron lining in stock will permit continued driving of bore. Design staff to continue with plans for future contracts

Although recognition was given early this week to the possibility that completion of New York City's Battery Tunnel may be delayed by the war, present plans are to continue the tunnel driving as long as men and materials are available, according to Ole Singstad, chief engineer of the New York City Tunnel Authority. The recognition of possible delay was embodied in a request from Fearson Shortridge, manager of the Authority, to postpone acquisition of land for the Manhattan approaches.

Mr. Singstad explained Mr. Shortridge's statement by explaining that when the tunnel's A-2 priority rating was cancelled in December, a careful study was made of possible future procedure. It was decided, since the two principal tunnel driving contracts were underway, since cast iron lining was on hand for the soft ground sections and since the sandhogs, whose special capabilities are not required in war work, would otherwise be unemployed, that the work should be continued. Unless a new emergency arises the tunnel can be holed through late in 1943. In the meantime the Authority's design force is to complete all future contract plans, so that they will be ready for bids when the situation permits.

Both rock and soft ground tunneling

The two contracts underway, each for just under $14,000,000 and each involving about 3,000 ft. of twin-tube tunnel extending out from the Brooklyn and Manhattan shore shafts, are held by the George H. Flinn Corp. and Mason & Hangar, Inc., respectively. Work at the Brooklyn end, which began last June, is in soft ground and requires shield tunneling under air with immediate installation of cast iron lining. As stated, the lining is on hand, having been ordered in November, 1940, under a three million dollar contract with the Bethlehem Steel Co. Work at the Manhattan end begun last October is in rock and will be carried on in free air. Cast iron liners for this section can follow at any time.

It will be recalled that the original plans contemplated a shaft near Governors Island, midway in the tunnel length, from which driving could be carried both ways. Bids on this work, which also covered 1,600 ft. of rock tunnel, were called for Dec. 19, but were cancelled when the tunnel lost its priority rating. Present plans are to postpone work on the Governors Island shaft for the time being, and to arrange to hole through from the two end headings.

Taking the worst possible view of the war emergency, it is conceivable that the tunneling work might have to be stopped short of holing through. The rock tunnel could, of course, be safely suspended at any time and, according to Mr. Singstad, the same is true of the shield work because the soft ground in the East River, in contrast to Hudson River silt, is firm and stable. The shields would stay in place indefinitely, and it would only be necessary to install a temporary concrete bulkhead adjacent to its rear end.

Mexico schedules much improvement work

As a part of its program aimed at bringing principal seaports up to the status of first-class terminals, the Mexican Marine Ministry has been authorized to expend a total of $1,755,000 at Coatzcoalcoas, on the Gulf, and Manzanillo, on the Pacific, in Sinaloa State.

Highway work recently authorized includes construction of the western section of the Pan-American Highway, from Nogales in Sonora State to Mexico City; and a contract approved by Chihuahua State for the construction of a $210,000 road from Chihuahua City to the Sonora State line, traversing several important mining and agricultural regions.

Other improvement work scheduled includes plans for expenditure of $815,000 by the city of Leon, in Guanajuato State, to modernize its water drainage.

Speeding the War Effort:

America's war effort goes forward at an increasingly faster rate, through many agencies and in many fields. Here are some developments of the past week of special interest to the engineer and constructor:

Fancy radiators, concealed piping, and other heating equipment luxuries will probably disappear from trade channels for the duration of the war, it was indicated by the Plumbing and Heating Branch of the War Production Board. A simplification program agreed to by manufacturers will reduce the number of sizes of radiator valves, trap bodies, and other items in order to save productive capacity and critical materials. The program will probably include the use of cast iron in a number of parts which formerly consumed brass, and elimination of several connections required for concealed radiation.

Highways designed to thwart possible attackers who might use them as landmarks and guides, and provide protection for convoys and motorists, are being studied by students in landscape architecture at Pennsylvania State College. A recent exhibit showed that highways "designed to fit the landscape"—following the contours of the countryside traversed—can be camouflaged effectively through the use of shrubbery.

Sufficient burlap and osnaburg (cotton) to go more than eight times around the world has been purchased by the Supply Division, Corps of Engineers, for use in making sandbags which are being produced at the rate of more than a million a day. These will be used by the Army, Navy and Marine Corps and, perhaps, by the Office of Civilian Defense, for field fortifications, gun emplacement protection, barricades and trench fortifications, protection of buildings, construction of air raid shelters and barricades in case of land attack.

As an aid to the nation's program of saving pig tin, and to help can markers' wartime demands, United States Steel Corp. subsidiaries are installing three additional electrolytic tin plating production lines, and six supplemental production lines for chemically treating black plate. These new facilities will cost about 5½ million dollars and are to be located in subsidiary plants in the Chicago, Pittsburgh, and Birmingham districts. The new lines for the production of electrolytic tin plate will have a total annual capacity of approximately 225,000 tons.

A national directory of automobile "graveyards" is being prepared by the War Production Board, with the assistance of the Work Projects Administration and the Department of Agriculture, to determine the amount of scrap iron and steel available from that source. Any lot or building with five or more passanger cars or trucks in various stages of dismantling will be classified as a "graveyard." It is estimated that there are 30,000 such "graveyards" throughout the country. Although there has never been a complete record of the total number of auto graveyards, nor an exact estimate of the number of junk cars, the most recently available figures place the number of obsolete cars at between three and four million—a figure which might provide from two to three million tons of scrap needed for the war program.

OBITUARY

Charles A. Marshall, 76, general engineer at Sharp & Dohme, Inc., Philadelphia, Pa. died Feb. 24.

Elwood R. Horton, 45, vice-president of George S. Armstrong & Co., New York, consulting engineering firm, died Feb. 22 at his home in Darien, Conn.

John W. Curren, Sr., 72, first chief engineer of the Springfield, Ohio, city water plant, died recently at Springfield. He entered the city's service, as superintendent of the water works in 1909, and became commissioner in 1911.

H. Ray Wertz, a district engineer in the Pennsylvania Department of Highways, died Feb. 27 in Philadelphia. Mr. Wertz, 52, was a resident of Newport, Pa.

Edwin Ford Dawson, for many years an engineering employee of the Reading Co., died Feb. 25 at his home in Philadelphia. He was 82 years old.

Edwin S. Rickard, 42, civil engineer for the United States Geological Survey at Sacramento, Calif., died Feb. 21.

Emil Benson, 78, retired building contractor of Providence, R. I., died in that city Feb. 26. He was a native of Skane, Sweden, and came to this country 59 years ago.

Clarence W. Lake, 52, for many years a building contractor at Topsfield, Mass., died Feb. 20.

Maj. Harold C. Moore, 52, formerly connected with the U. S. Engineers office in Memphis, Tenn., died Saturday at Obaddia, Panama.

Anders Joseph Johnson, 81, retired contractor of Kansas City, Mo., died Feb. 22, at Kansas City.

Carl P. Birkinbine, a civil engineer of Philadelphia, Pa., died Feb. 26. He was a specialist in water power and supply and drainage problems.

Andrew Jackson Stair, 77, building contractor of Knoxville, Tenn., died Feb. 26 at Knoxville.

Robert T. Bloodsworth, 56, senior highway engineer with the Federal Public Roads Administration, at Portland, Ore., died Feb. 20 in Portland. A graduate of Syracuse University. Mr. Bloodsworth had been in charge of highway planning survey activities for the states of Oregon, Washington and Montana during the last six years.

Eduardo McPherson Huerta, 35, civil engineer of the Mexican National Irrigation Commission, was drowned when the boat in which he was inspecting the basin of the dam at La Angostura, northwestern Mexico, capsized.

Robert J. Mickle, president of the Mickle-Milnor Engineering Co., died Feb. 23, at Philadelphia.

Ernest McCulloh, 75, of Minneapolis, a life member of the American Society of Civil Engineers and an authority on Mississippi river dam construction, died Feb. 17 at Minneapolis.

Edward H. Post, 71, retired civil engineer who built the first coke oven in Pittsburgh, Pa., died recently at the home of a son in Altadena, Calif.

Prizes awarded in steel institute competition

Iowa State College students took the first three prizes in the annual students' bridge design competition sponsored by the American Institute of Steel Construction. The prizes, of $200, $100, and $50, were awarded to Everett Thorbrogger, R. Kenneth Kendall, and Carlton Mueller.

Fifty-nine students from fifteen colleges participated in the competition. The competition problem was a steel highway bridge to carry a highway over a river crossing.

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John J. Eustis, for 30 years a contractor at Newton, Mass., died recently.

CONTRACTS AND CAPITAL

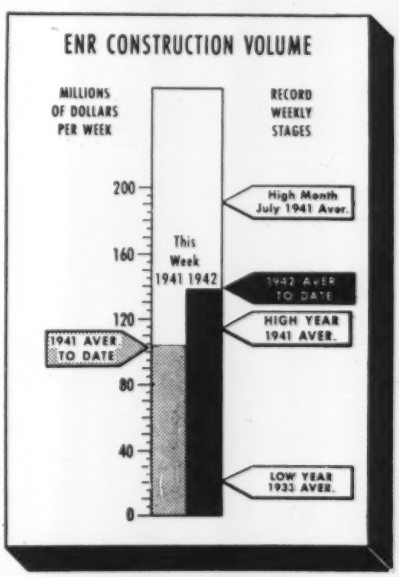
ENGINEERING CONSTRUCTION volume for the week totals $145,401,000, an increase of 40 percent over the corresponding week last year, but 45 percent below the 1942 high of a week ago. Private construction is 1½ percent above the week last year, and 67 percent higher than last week. Public volume tops a year ago by 50 percent, but is 51 percent lower than last week.

The current week's total brings 1942 construction to $1,409,004,000, an increase of 27 percent over the volume for the opening ten-week period last year. Private work, $142,171,000 for the period, is 57 percent below a year ago, but public construction, $1,266,833,000, is 63 percent higher as a result of the 115 percent gain in federal work.

In the classified construction groups, gains over last week are in sewerage, industrial and commercial buildings, and streets and roads. Increases over the 1941-week totals are in waterworks, sewerage, and commercial and public buildings.

New capital for construction purposes for the week totals $3,677,000, a decline of 59 percent from the volume reported for the week last year. All of the week's financing is in state and municipal bond sales.

New construction financing for the year to date, $1,376,140,000, is just double the $687,982,000 reported for the corresponding ten-week period last year.



CONTRACTS

(Thousands of dollars)

	Week Ending Mar. 6 1941	Feb. 26 1942	Mar. 5 1942
Federal	$59,994	$248,143	$112,869
State & Municipal	22,545	5,475	10,766
Total public	$82,539	$253,618	$123,635
Total private	21,423	13,004	21,766
TOTALS	$103,962	$266,622	$145,401

Cumulative
1942 (10 weeks) $1,409,004
1941 (10 weeks) $1,112,780

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1941 10 weeks	1942 10 weeks
NON-FEDERAL	$178,982	$134,185
Corp. Securities	56,169	28,832
State & Mun.	83,422	91,524
U.S.H.A. loans	13,521	.....
R.F.C. loans	25,870	13,829
FEDERAL	$509,000	$1,241,955
TOTAL CAPITAL	$687,982	$1,376,140

ENR INDEX NUMBERS

Index Base = 100		1913	1926
Construction Cost	Feb. '42	269.41	129.51
Building Cost	Feb. '42	218.44	118.08
Volume	Jan. '42	503	221

FHA MORTGAGES

	Week Ending Mar. 1 1941	Feb. 21 1942	Feb. 28 1942
Selected for appraisal			
Title II	$26,182	$16,631	$14,740*
Title VI	.....	$21,511	$21,058*

* Subject to revision.

CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

CHEMUNG COUNTY AIRPORT NEW YORK

OWNER: Civil Aeronautics Administration, First Region, LaGuardia Field, New York, N. Y.

PROJECT: Construction of Class 3 airport at Chemung County, New York, Airport, consisting of grading, draining, paving and lighting of airport, which includes three landing strips 500-ft. wide by 4,000-ft. long, and taxiways. Also includes complete dismantling, relocation or removal of existing structures and facilities at present intermediate field at the same location. Drainage, in general, consists of longitudinal pipe drains placed parallel to runways and drainage ditches bordering landing strips, and open drainage ditches with outlets into other ditches or natural water courses. Paving of runways on landing strips to be performed under another contract, as all bids for Schedule III (Paving) in these specifications were rejected and new bids asked March 11, 1942.

CONDITIONS: Contractor to furnish all materials under Schedule I and II; government to furnish the following material for Airport Lighting (Sched. IV): beacon tower and lightning arrestor; windcone assembly; cabinets; rotating beacon; airport series boundary, range and contact light units; wind tee unit; obstruction light fittings; astronomic clock; parkway cable; splice boxes; electric lamps; film cutouts; windcone assembly, externally lighted; and lattice masts. Rail and highway transportation facilities available near site of work. Wage rate minimums are: skilled labor, $1.00 to $1.50; semi-skilled, 55c. to $1.00; and common, 62½c. per hr.

BIDS: Seven bids were received January 2, 1942 for Schedule I (Clearing), ranging from $7,963 to $37,800. Contract awarded to second low bidder at $13,100. On Schedule II (grading, drainage, seeding) eleven bids were received, ranging from the contract low of $176,217 to $358,353. All bids were rejected on Schedule III (paving). On Schedule IV (Airport Lighting) five bids were received ranging from the contract low of $21,287 to $36,948.

Schedule I—Clearing Site

LIST OF BIDDERS: Time for completion, 45 days.

1. Sunswick Bldg. Corp., Long Island, N. Y $7,963
2. Grandview Nurseries, Mt. Vernon, N. Y. (contract) 13,100
3. Dalrymple Gravel and Cont'g. Co., Elmira, N. Y 13,854
4. Tomack Subsidiary Inc., Rochester, N. Y 18,175
5. O'Brien-Fortin, Inc., and Delmar Engr. Corp., New York, N. Y. 19,550
6. D. W. Winkleman Co., Syracuse, N. Y 24,310
7. N. R. Corbisello, Binghamton, N. Y 37,800

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clear and remove structures	L. S.	$1,167.00	$5,350.00	$4,300.00
2. Dismantle exist. intermediate field	L. S.	3,734.00	2,600.00	5,365.00
3. Move, re-erect Airway Keeper's house	L. S.	2,607.00	4,350.00	3,660.00
4. Drill well, water supply system	40 l. f.	2.04	5.00	2.035
5. Install casing, water supply system	40 l. f.	1.75	2.50	1.485
6. Install screen, water supply system	L. S.	17.50	160.00	178.20
7. Constr. well pit, install pump, make elec. connections	L. S.	286.00	340.00	210.00

Schedule II—Grading, Drainage, Seeding

LIST OF BIDDERS: Time for completion, 100 days.

1. Grandview Nurseries, Mt. Vernon, N. Y. (contract) $176,217
2. Sunswick Bldg. Corp., Long Island City, N. Y 179,891
3. Lindholm Constr. Co., Inc., Pittsfield, Mass 208,052
4. D. W. Winkleman Co., Syracuse, N. Y 227,847
5. Tomack Subsidiary, Inc., Rochester, N. Y 253,940
6. O'Brien-Fortin, Inc., and Delmar Engr. Corp., New York, N. Y 259,376
7. Binghamton Constr. Co., Binghamton, N. Y. 267,883
8. John Arborio, Poughkeepsie, N. Y $268,628
9. C. E. Knowles, Inc., Gowanda, N. Y 288,274
10. Dalrymple Gravel & Cont'g. Co., Elmira, N. Y 289,124
11. N. R. Corbisello, Binghamton, N. Y 358,353

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Earth excavation	170,000 c. y.	$0.25	$0.235	$0.30
2. 6-in. I. D. pipe with porous bkfill., runway drainage	4,050 l. f.	1.60	1.60	2.00
3. 8-in., as above	5,657 l. f.	1.70	1.68	2.10
4. 10-in., as above	4,484 l. f.	1.85	1.95	2.90
5. 12-in., as above	4,681 l. f.	2.50	2.60	3.90
6. 15-in., as above	1,092 l. f.	2.90	3.17	4.40
7. 18-in., as above	3,799 l. f.	3.73	3.70	5.10
8. 21-in., as above	1,247 l. f.	4.37	4.17	5.70
9. 30-in., as above	629 l. f.	7.06	6.82	10.50
10. 8-in. pipe for runway culverts	250 l. f.	2.50	2.34	3.00
11. 12-in. pipe for runway culverts	300 l. f.	2.00	1.99	3.75
12. 15-in. pipe for runway culverts	1,034 l. f.	2.35	2.13	3.38
13. 18-in. pipe for runway culverts	300 l. f.	2.90	2.63	4.50
14. 21-in. pipe for runway culverts	731 l. f.	3.75	3.21	4.40
15. 24-in. pipe for runway culverts	245 l. f.	4.70	3.86	6.00
16. 30-in. pipe for runway culverts	1,598 l. f.	6.50	6.11	8.75
17. 42-in. pipe for runway culverts	24 l. f.	12.00	9.46	15.00
18. Seeding	200 ac.	135.00	152.00	90.00
19. Commercial fertilizer	100 ton	45.00	39.00	60.00
20. Agricultural hydrated lime	100 ton	14.00	30.00	15.00
21. Catch basins, 2x2-ft. inside, and overall outside height 4½ to 5½ ft	43 ea.	110.00	122.00	90.00
22. Catch basins, 2x2-ft. inside dimen. and overall outside ht. 5½ to 6½ ft	25 ea.	121.00	129.00	100.00
23. As above, overall out. ht. 6½ to 7½ ft	3 ea.	132.00	152.00	115.00
24. Catch basins, 3¾x3¾ ft. I. D. and overall outside ht. 5½ to 7½ ft	15 ea.	182.00	164.00	200.00
25. Earth excav. for drain. sys. outfall to Sing Sing Creek	9,675 c. y.	.55	.59	.50
26. 3-in. fiber duct furn. and installed in single runs	6,285 l. f.	.35	.68	.60

Schedule IV—Airport Lighting

LIST OF BIDDERS: Time for completion, 120 days.

1. Elco Installation, Inc., New York, N. Y. (contract) (a) $21,821; (b) 21,287
2. O'Connell Electric Co., Rochester, N. Y (a) 24,744; (b) 24,818
3. Sunswick Bldg. Corp., Long Island City, N. Y (a) 26,965; (b) 27,189
4. Tomack Subsidiary, Inc., Rochester, N. Y (a) 27,945; (b) 28,269
5. O'Brien-Fortin, Inc., and Delmar Engr. Corp. New York, N. Y (a) 36,808; (b) 36,948

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Concrete transformer vault	L. S.	$2,958.00	$2,150.00	$3,600.00
2. Excavating trench, 18-in. deep	50,000 l. f.	.10	.20	.045
3. Excavating trench, 36-in. deep	3,500 l. f.	.15	.30	.11
4. Inst. series disconnecting boundary or range lights, cone type	73 units	18.00	15.00	39.20
5. Inst. 51-ft. beacon tower and 36-in. beacon	L. S.	610.00	325.00	448.00
6. Install wind tee unit	L. S.	306.00	180.00	448.00
7. Obstruction lights, incl. 25-ft. pole	1 ea.	139.00	40.00	84.00
8. Obstruction lights, incl. 35-ft. pole	1 ea.	149.00	50.00	95.00
9. Obstruction lights, incl. 45-ft. pole	1 ea.	181.00	60.00	112.00
10. Obstruction lights, incl. 55-ft. pole	1 ea.	195.00	70.00	129.00
11. 78-ft. mast	1 ea.	56.00	50.00	252.00
12. 87-ft. mast	1 ea.	70.00	60.00	275.00
13. 108-ft. mast	1 ea.	98.00	75.00	330.00
14. Inst. 36-in. externally lighted wind cone	L. S.	86.00	100.00	112.00
15. Concrete, 1:2:4 mix	1 c. y.	12.00	20.00	22.50
16. Reinforcing steel	100 lb.	.07	.08	.17
17. 2-in. galvanized conduit	20 l. f.	.40	.50	.65
18. Inst. series flush type contact light units adjacent to french drain	100 units	29.80	25.00	50.40
19. Inst. series flush type contact lights within runway	16 units	29.40	50.00	50.40
20. Inst. control panel in transformer vault (Alternate A)	L. S.	1,472.00	876.00	2,240.00
21. Control panel installation in Control Bldg. (Alternate B)	L. S.	938.00	950.00	2,464.00
22. Inst. equip. for operating contact lights	L. S.	962.00	1,635.00	1,244.00
23. Terra cotta duct	400 l. f.	2.75	2.00	2.24
24. Series disconnecting boundary or range lights flush type	6 units	23.00	15.00	39.20
25. Inst. cable in 18 or 36-in. trenches	50,000 l. f.	.04	.03	.0675
26. Inst. cable in fiber duct, conduit, or terra cotta duct	7,000 l. f.	.05	.05	.09
27. Inst. obstruct. lights on exist. poles or struct	10 ea.	24.50	35.00	84.00
28. Inst. 750-watt series to multiple isolating transformer	5 ea.	78.00	100.00	44.80